

CLAIMS

We claim:

1. A polishing method comprising the steps of:

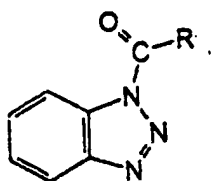
forming a layer made of material containing a metal as a main component over a substrate having recessed portions on a surface thereof so as to fill said recessed portions with said metal layer; and

5 polishing said metal layer by a chemical mechanical polishing method using a slurry including a polishing agent containing

a chemical agent being responsible for forming a protective film on the surface of said metal layer by reacting with said material containing a metal as a main component, wherein said chemical agent includes at least a carbonyl derivative of benzotriazole, and

10 an etching agent being responsible for etching said material containing a metal as a main component.

2. The method of claim 1, wherein said carbonyl derivative of benzotriazole has the formula



where R is selected from the group consisting of - CH₃ (methyl), - CH₂CH₃ (ethyl), - CH₂CH₂CH₃ (propyl), - CH₂CH₂CH₂CH₃ (n-butyl), - C(CH₃)₃ (tert-butyl), p-tolyl, 1 - Benzotriazolyl - 1 - butamido, 2 - pyridyl, 3 - pyridyl, 4 - pyridyl, 2 - thiophenyl, and 3 - thiophenyl.

3. The method of claim 1, wherein said etching agent includes an oxidizer; an acid or base; and a buffering agent or organic amine.

4. The method of claim 1, wherein said etching agent includes an oxidizer selected from the group consisting of H₂O₂, KIO₃, and Fe³⁺; HF or (CH₃)N(OH); and a buffering agent or organic amine selected from the group consisting of NH₄(CH₃CO₂), alkanol amine, and amino acid.

5. The method of claim 1, wherein said carbonyl derivative of benzotriazole comprises from about 0.0001 to 10% of said polishing agent.

6. The method of claim 1, wherein said carbonyl derivative of benzotriazole comprises from about 0.01 to 5.00% of said slurry.

7. The method of claim 1, wherein said metal is selected from the group comprising Cu, an Cu alloy, Al, and an Al alloy.

8. A polishing method comprising the steps of:

forming a film made of material containing a metal as a main component over a substrate having recessed portions on a surface thereof so as to fill said recessed portions with said film; and

5 polishing said film by a chemical mechanical polishing method using a slurry including a polishing agent containing

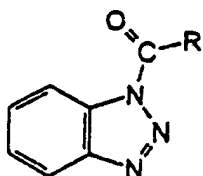
a chemical agent being responsible for forming a protective film on the surface of said film by reacting with said material containing a metal as a main component, and

10 an etching agent being responsible for etching said material containing a metal as a main component;

thereby forming a conductive film in said recessed portions,

wherein said metal is Cu or a Cu alloy and said chemical agent includes at least includes at least a carbonyl derivative of benzotriazole.

9. The method of claim 8, wherein said carbonyl derivative of benzotriazole has the formula



where R is selected from the group consisting of - CH₃ (methyl), - CH₂CH₃ (ethyl), - CH₂CH₂CH₃ (propyl), - CH₂CH₂CH₂CH₃ (n-butyl), - C(CH₃)₃ (tert-butyl), p-tolyl, 1 - Benzotriazolyl - 1 - butamido, 2 - pyridyl, 3 - pyridyl, 4 - pyridyl, 2 - thiophenyl, and 3 - thiophenyl.

10. The method of claim 8, wherein said etching agent includes an oxidizer; an acid or base; and a buffering agent or organic amine.

11. The method of claim 8, wherein said etching agent includes an oxidizer selected from the group consisting of H₂O₂, KIO₃, and Fe³⁺; HF or (CH₃)N(OH); and a buffering agent or organic amine selected from the group consisting of NH₄(CH₃CO₂), alkanol amine, and amino acid.

12. The method of claim 8, wherein said carbonyl derivative of benzotriazole comprises from about 0.0001 to 10% of said slurry.

13. The method of claim 8, wherein said carbonyl derivative of benzotriazole comprises from about 0.01 to 5.00% of said slurry.

14. A polishing method comprising the steps of:

forming a film made of material containing a metal as a main component over a substrate having recessed portions on a surface thereof so as to fill said recessed portions with said film; and

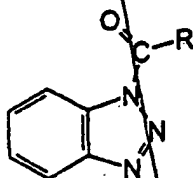
5 polishing said film by a chemical mechanical polishing method using a slurry including a polishing agent containing

a chemical agent being responsible for forming a protective film on the surface of said film by reacting with said material containing a metal as a main component, and

10 an etching agent being responsible for etching said material containing a metal as a main component;

thereby forming a conductive film in said recessed portions,

wherein said metal is Cu or a Cu alloy and said chemical agent includes at least includes at least a carbonyl derivative of benzotriazole having the formula



20 where R is selected from the group consisting of - CH₃ (methyl), - CH₂CH₃ (ethyl), - CH₂CH₂CH₃ (propyl), - CH₂CH₂CH₂CH₃ (n-butyl), - C(CH₃)₃ (tert-butyl), p-tolyl, 1 - Benzotriazolyl - 1 - butamido, 2 - pyridyl, 3 - pyridyl, 4 - pyridyl, 2 - thiophenyl, and 3 - thiophenyl.

15. The method of claim 14, wherein said etching agent includes an oxidizer; an acid or base; and a buffering agent or organic amine.

16. The method of claim 14, wherein said etching agent includes an oxidizer selected from the group consisting of H_2O_2 , KIO_3 , and Fe^{3+} ; HF or $(\text{CH}_3)_3\text{N}(\text{OH})$; and a buffering agent or organic amine selected from the group consisting of $\text{NH}_4(\text{CH}_3\text{CO}_2)$, alkanol amine, and amino acid.

17. The method of claim 14, wherein said carbonyl derivative of benzotriazole comprises from about 0.0001 to 10% of said slurry.

18. The method of claim 14, wherein said carbonyl derivative of benzotriazole comprises from about 0.01 to 5.00% of said slurry.